Updates for GenFit tracking

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Some reminders for PHG4TrackKalmanFitter

PHG4TrackKalmanFitter is a track re-fitter using GenFit.

- Refit tracks with full Kalman Filter (realistic geometry, field, material effect...)
  - Needs SvtxTrackMap from Alan's tracking code.
  - Needs SvtxClusterMap to extract measurements.
  - Make a new Node called "SvtxTrackMapRefit"

- Temporary RAVE vertexing implementation.
  - Make a new Node called "SvtxVertexMapRefit"

New features of PHG4TrackKalmanFitter

- Output mode control: (Implemented)
  - *OverwriteOriginalNode*: (default)
    - Refitted track overwrite original SvtxTrackMap
  - *MakeNewNode*:
    - SvtxTrackMap (origin) + SvtxTrackMapRefit (refit)

- Primary track: re-fit track with a RAVE vertex (Implemented, testing)
  - Results in new Node: "PrimSvtxTrack"

- Fill SvtxTrackState's of SvtxTrack's: (Implemented)
  - Fill SvtxTrackState's at each SvtxCluster (measurement position).
  - Radius set to the cylinder radius.

- Working with Jin's Geometry exportation stored in the DST run node. (Implemented)
  - On-the-fly geometry transportation.
  - Tested with MIE setup, will try maps+TPC setup.

- Outlier rejection. (Implementing)
  - Using Deterministic Annealing Fitter (DAF) of GenFit.

Output mode control

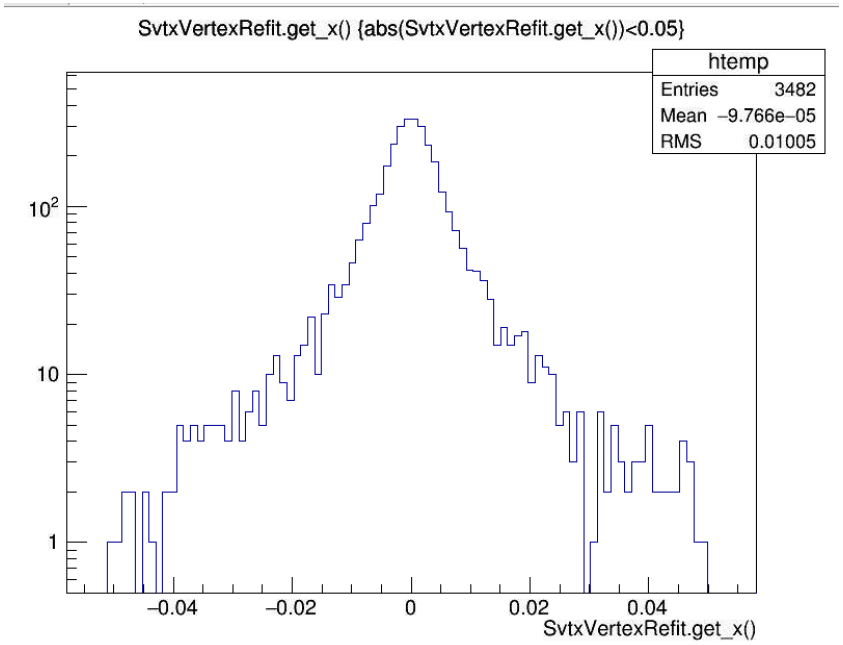
DST out

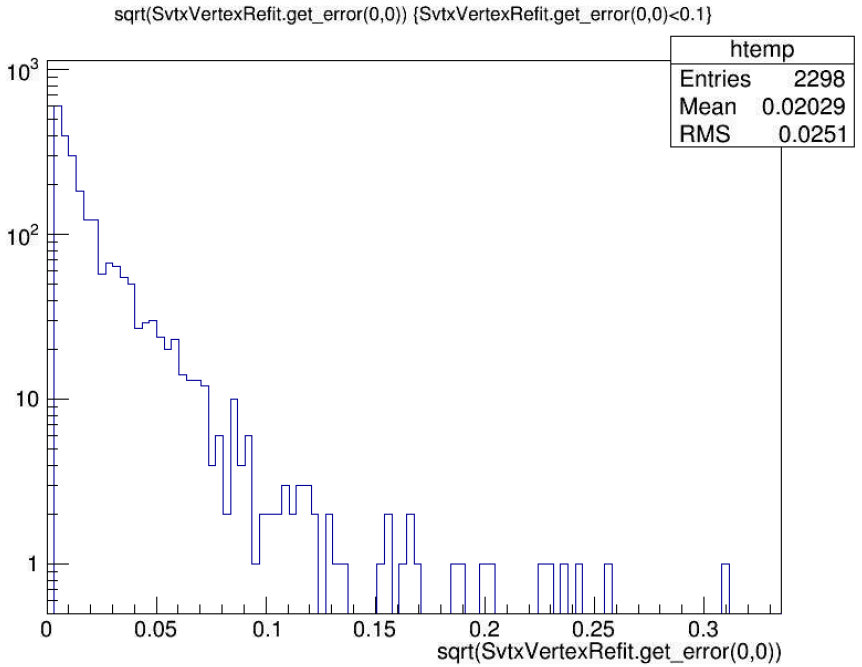
- DST.SVTX.PrimaryTrackMap
- DST.SVTX.SvtxVertexMapRefit
- DST.SVTX.G4CELL_SVTX
- DST.SVTX.SvtxHitMap
- DST.SVTX.SvtxClusterMap
- DST.SVTX.SvtxTrackMap
- DST.SVTX.SvtxVertexMap
- DST.G4HIT_PIPE
- DST.G4HIT_SVTX
- DST.G4HIT_SVTXSUPPORT
- DST.G4HIT_BH_1
- DST.G4HIT_BH_FORWARD_PLUS
- DST.G4HIT_BH_FORWARD_NEG
- DST.G4TruthInfo
- DST.BBC.BbcVertexMap

Eval root out

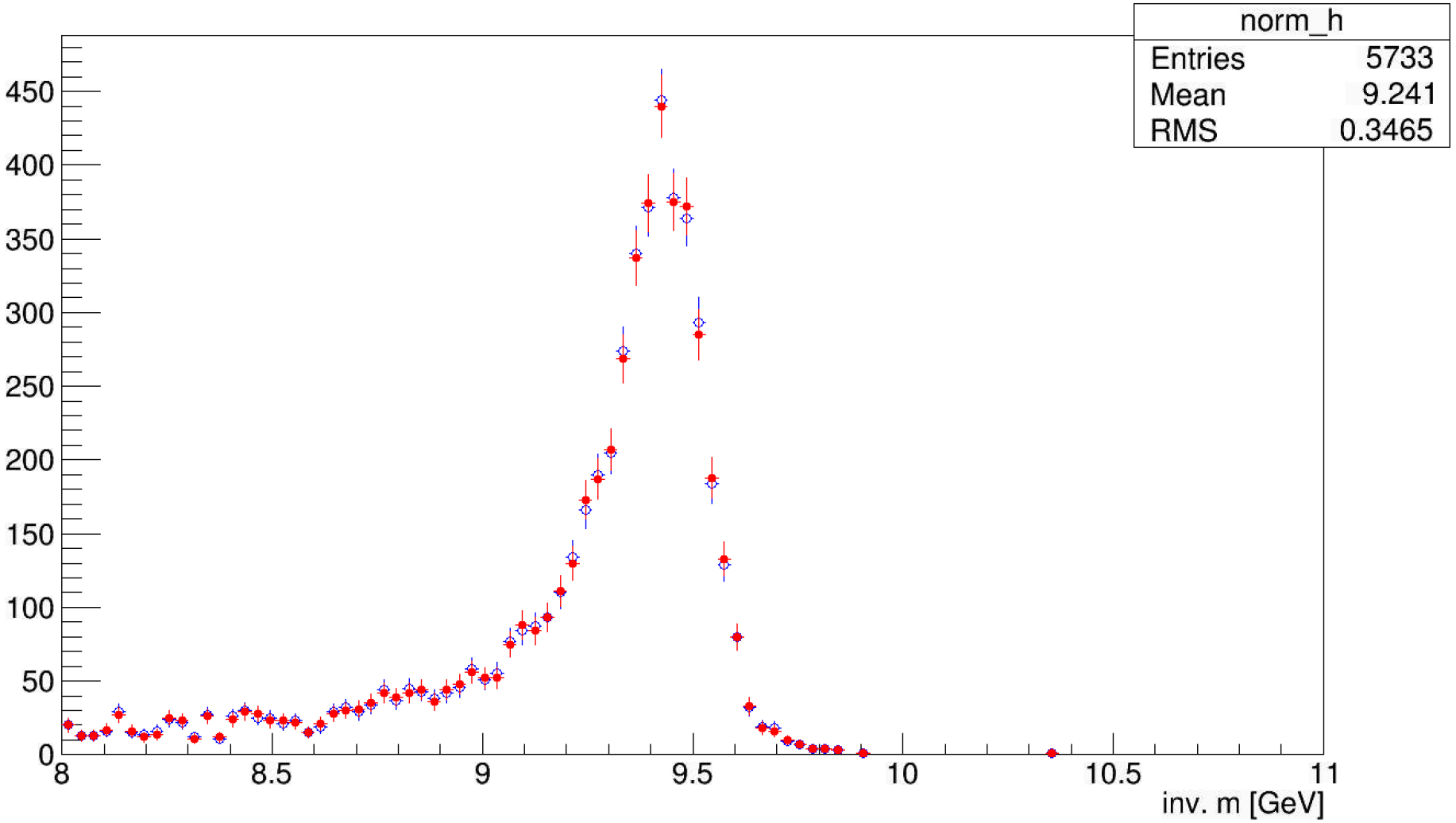
- PrimaryParticle
- TruthVtx
- SvtxTrack
- SvtxVertex
- SvtxTrackRefit
- PrimSvtxTrack
- SvtxVertexRefit

vertexing from RAVE

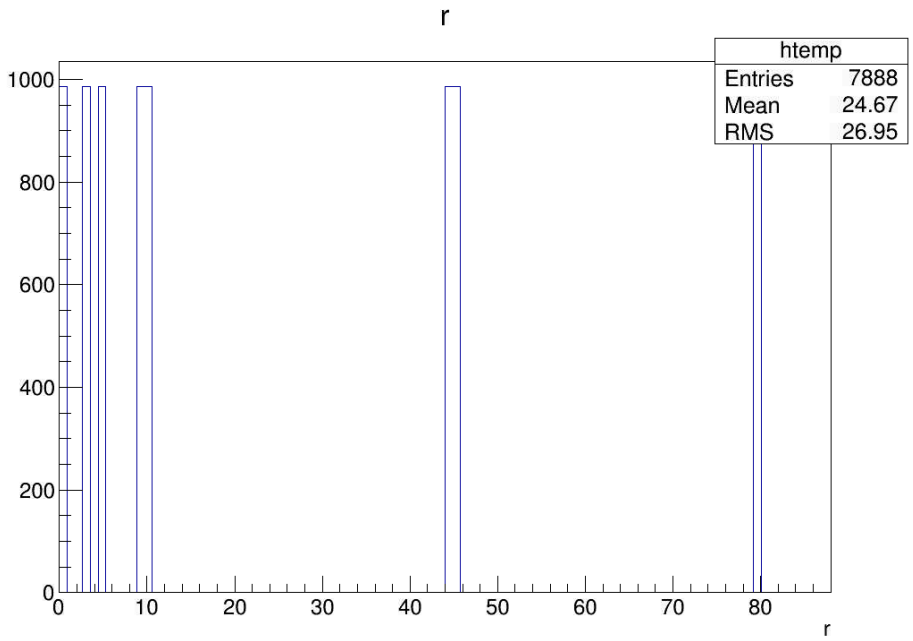




Primary track from Upsilon(1s), real reco'd vertex



SvtxTrackState radius

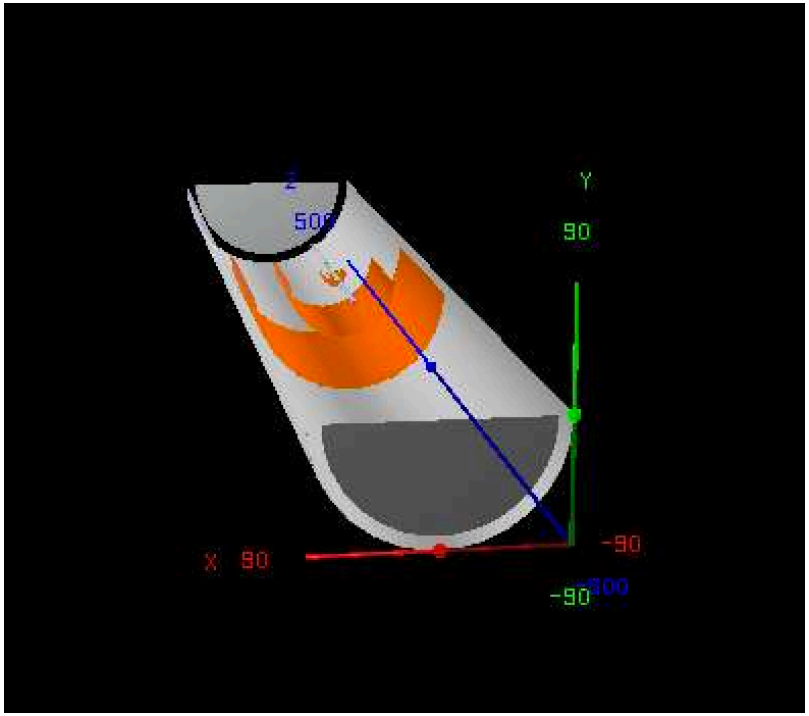


2.71
4.63
9.5
10.5
44.5
45.5
80

MIE

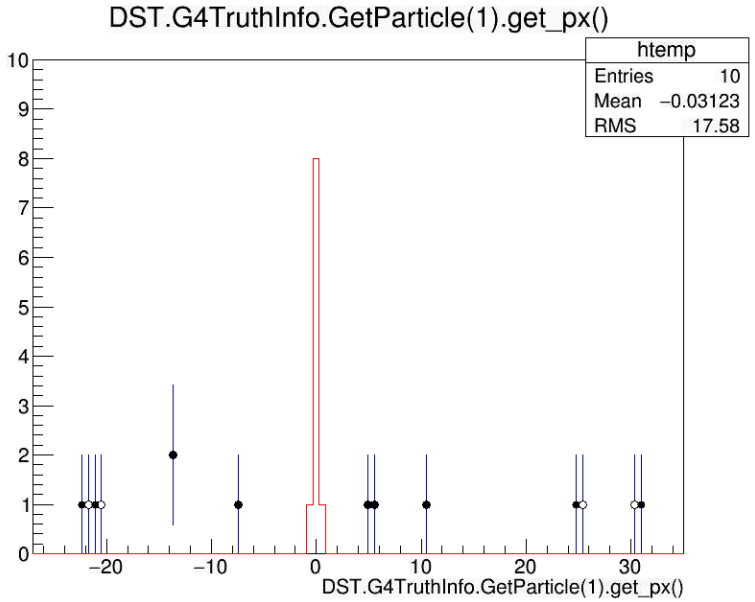
TGeo in the Run node, Jin's pull request #183

- T1;1
  - RUN.G4GEOPARAM_VAC_BE_PIPE_0
  - RUN.CYLINDERGEOM_PIPE
  - RUN.G4GEOPARAM_BE_PIPE_1
  - RUN.G4GEOPARAM_VAC_N_AL_PIPE_2
  - RUN.G4GEOPARAM_N_AL_PIPE_3
  - RUN.G4GEOPARAM_VAC_S_AL_PIPE_4
  - RUN.G4GEOPARAM_S_AL_PIPE_5
  - RUN.G4GEOPARAM_SVTX_0
  - RUN.CYLINDERGEOM_SVTX
  - RUN.G4GEOPARAM_SVTXSUPPORT_0
  - RUN.CYLINDERGEOM_SVTXSUPPORT
  - RUN.G4GEOPARAM_SVTX_1
  - RUN.G4GEOPARAM_SVTXSUPPORT_1
  - RUN.G4GEOPARAM_SVTX_2
  - RUN.G4GEOPARAM_SVTXSUPPORT_2
  - RUN.G4GEOPARAM_SVTX_3
  - RUN.G4GEOPARAM_SVTXSUPPORT_3
  - RUN.G4GEOPARAM_SVTX_4
  - RUN.G4GEOPARAM_SVTXSUPPORT_4
  - RUN.G4GEOPARAM_SVTX_5
  - RUN.G4GEOPARAM_SVTXSUPPORT_5
  - RUN.G4GEOPARAM_SVTX_6
  - RUN.G4GEOPARAM_SVTXSUPPORT_6
  - RUN.G4GEOPARAM_BH_1
  - RUN.CYLINDERGEOM_BH_1
  - RUN.G4GEOPARAM_BH_FORWARD_PLUS_1
  - RUN.CYLINDERGEOM_BH_FORWARD_PLUS
  - RUN.G4GEOPARAM_BH_FORWARD_NEG_1
  - RUN.CYLINDERGEOM_BH_FORWARD_NEG
  - RUN.GEOMETRY_IO
  - RUN.CYLINDERCELLGEOM_SVTX

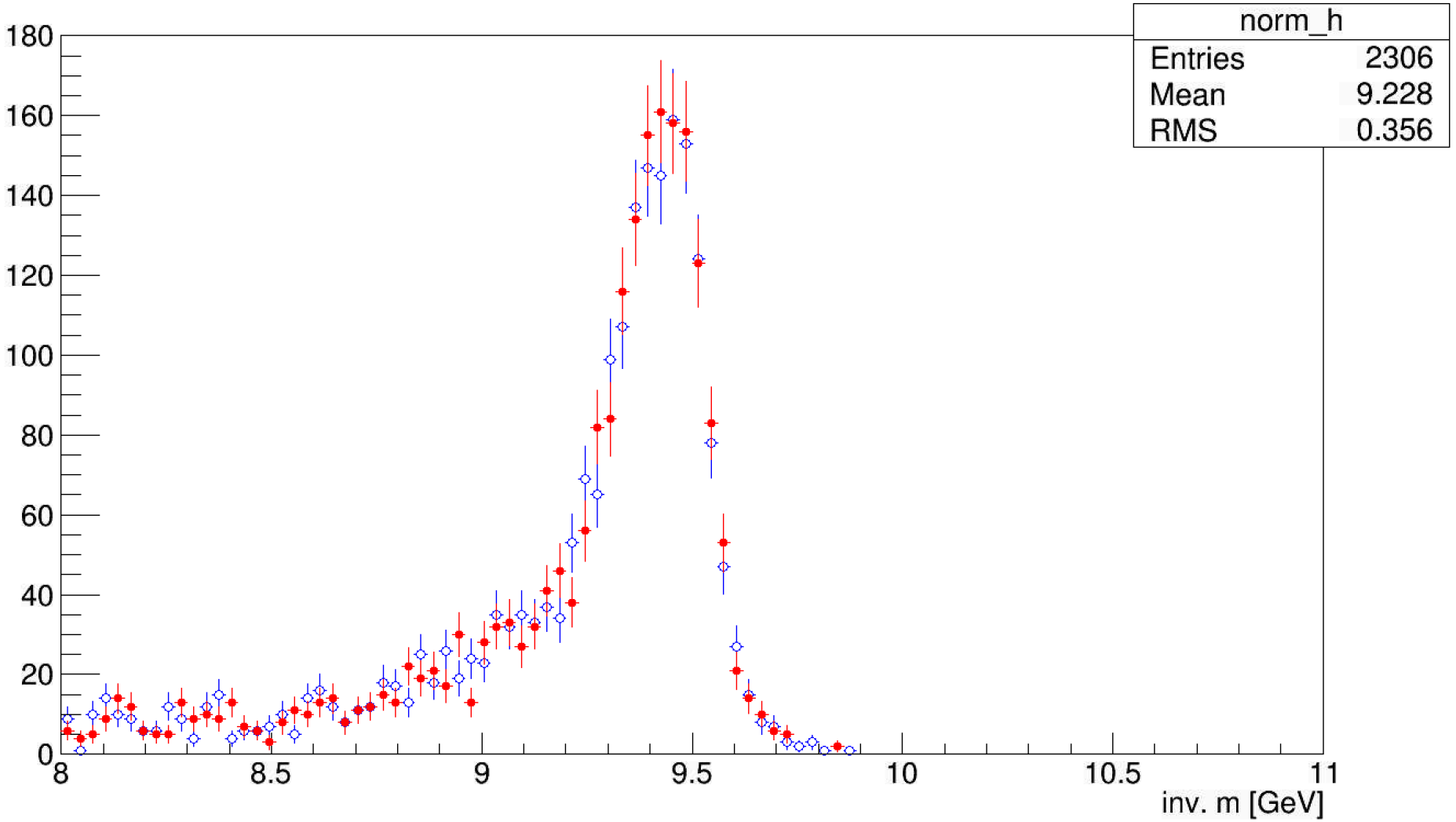


Backups

TGeo exportation, check output using 10 single pion tracks



Primary track from Upsilon(1s), manually input with (7, 7, 30)micron resolution

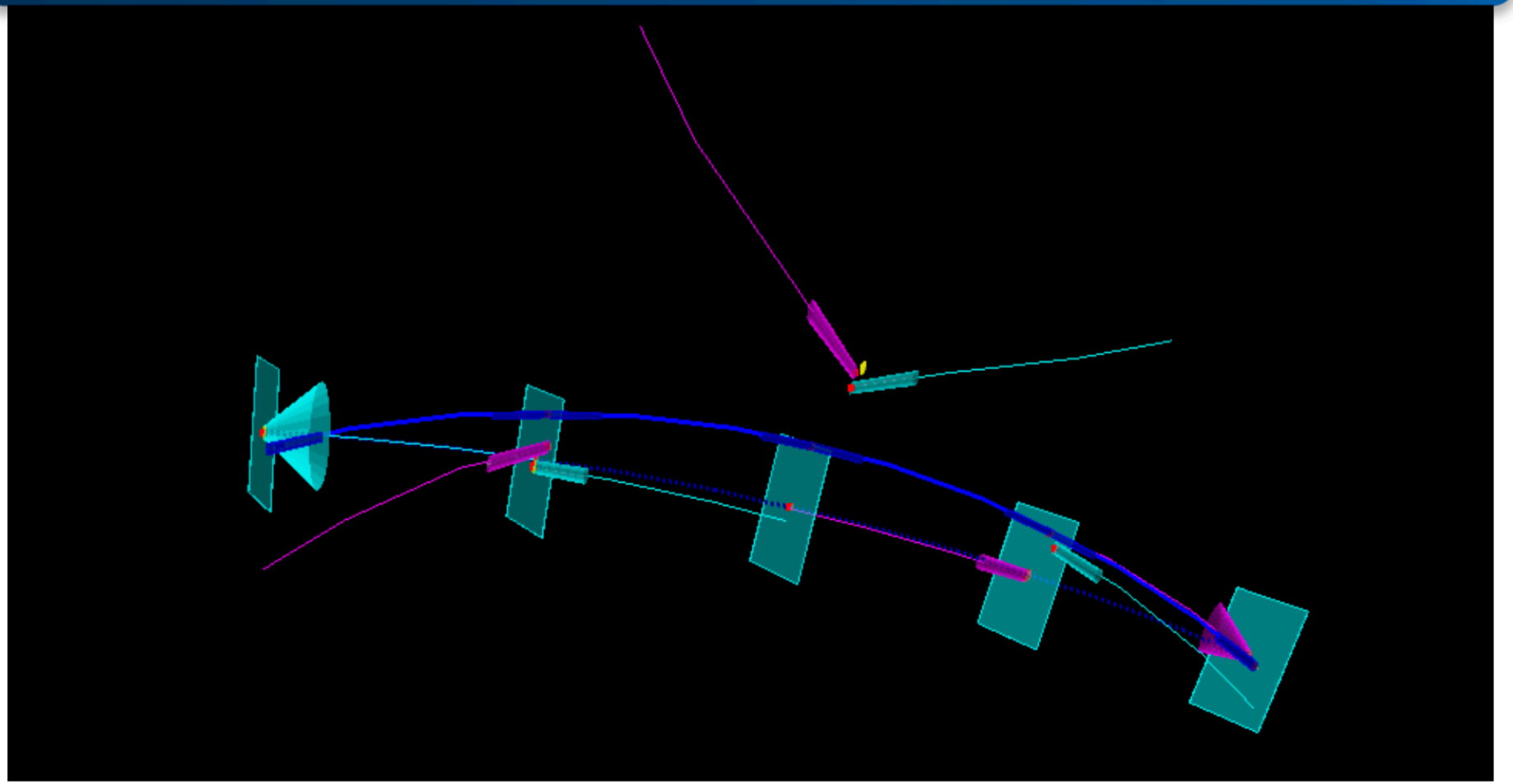


Deterministic Annealing Filter

DAF

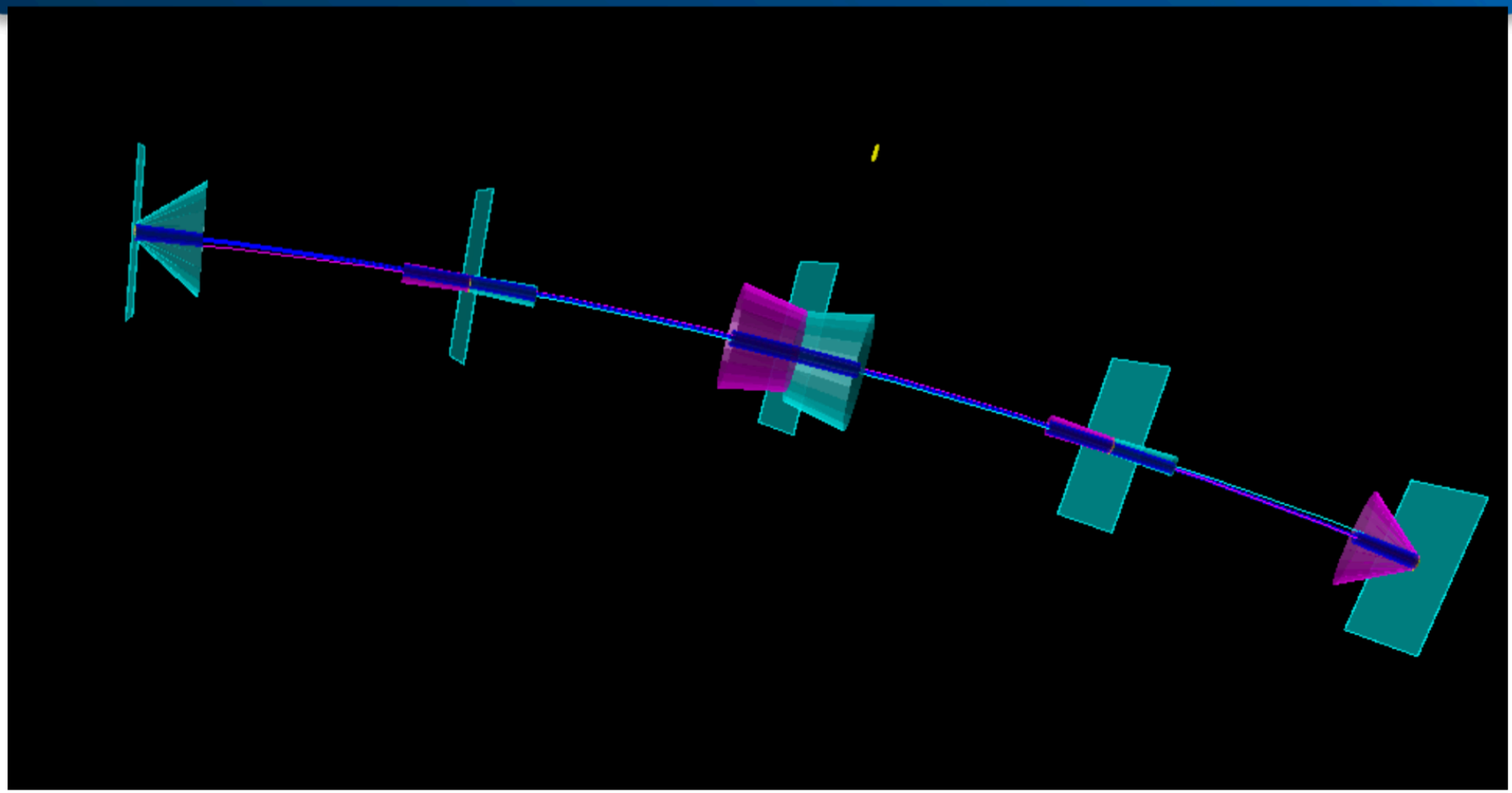
- Robust track fitter.
- Produces assignment probabilities (weights) of measurements.
- Iterative Kalman filter with weighting and annealing to find best fit.
- Can e.g. be used to reject outliers or to resolve left/right ambiguities of wire-measurements.

Outlier - Fitted with the DAF



$\beta = 100$	initial weights:	1	1	1	1	1
$\log_{10} \beta = 2$	new weights:	0.4960	0.4238	0.1940	0.4310	0.5003

Outlier - Fitted with the DAF



After 6 iterations with decreasing β:

$\beta = 0.1$	initial weights:	0.9997	0.9997	1.725×10^{-290}	0.9997	0.1000
$\log_{10} \beta = -1$	new weights:	1	1	0	1	1